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**Garcin Armand,**
Student,
Ural Federal University,
Ekaterinburg, Russia,

**Kuznetsov Pavel,**
Seniour Lecturer,
Ural Federal University,
Ekaterinburg, Russia

# RELEVANCE OF FOOD INDEPENDENCE. COMPARATIVE ANALYSIS OF FRENCH FOOD PRODUCTION

*Abstract:*
Research focuses on estimating food independence of European countries. Two indicators were introduced and calculated for European countries. The results show a vast difference between them and allows to group countries by them.

*Keywords:*
Food Sustainability Index, agriculture independence, European Union (EU)

Europe's food independence is an issue that has been raised along the Covid-19 pandemic. This paper will allow the reader to understand the geopolitical stakes of food sovereignty, but also its costs. We have selected several articles after assessing their relevance to the topic in order to understand the context in which agriculture has developed throughout human history.

This historical review from prehistory to the end of the 20th century, dealing with the history of agriculture simultaneously of the history of intercontinental trade of agricultural products, reveals that there is a kind of cycle in agricultural development. An agricultural and local discovery improving the efficiency of farming production leads to an increase in population. This is followed by a phase of international trade, facilitated by technical progress in food preservation and bringing the spread of the agricultural discoveries. But the cycle is interrupted by a crisis (health or economic crisis, wars…). The cycle ends with a period of recession until a new discovery is made. During the review, we could also identify that these cycles are shorter and shorter the more we advance in the humankind history.

A simple estimation of food sovereignty can be easily done by calculating if the production of food products is over (or under) the consumption. In the first case, the country is self-sufficient, and in the second it isn't. Even if we can have an idea of the sovereignty of the country, the analysis should be focused on one production (cereals, meat…) because not all food products have the same nutritional or economical value. Furthermore, we should add the amount of import and export which fluctuates in peacetime or period of international conflict. Moreover, the climatic conditions affect directly the farming production, and indirectly the price of the crops and consequently the international trade. In the end, it is extremely difficult to globally and accurately measure food independence without deeply detailed statistics. Thus, we will focus on crops production (cereals, seeds, fruits and vegetables) from the year 2014 to 2018 throughout this study.

We will only deal with European countries because all of them are part of the Common Agricultural Policy although they have different national strategies. Furthermore, the European states have different level of development, size and topography, and using this sample will give us the chance to analyse different profiles. The main data source for calculations will be UN Food and Agriculture Organization [1].

We should take in consideration the future of the agriculture sector of the European countries. The indicator we will take is the Food Sustainability Index [2].It is used to measure the sustainability of food and nutrition systems, the final grade depending on three sectors: Food Loss and Waste, Sustainable Agriculture and Nutritional Challenges. As long as this paper is analysing agriculture, we will consider only the Sustainable Agriculture sector, which is divided in 3 branches, all of them considering different aspects of agriculture.

The study will continue with the measurement of food independence for the year 2018 of European countries. We faced several issues to compile all the information, especially about consumption of the states. Hence, we are going to explain step by step how this part of the research has been conducted. We started to collect the crops production, using the data base of the European Commission. Then, the first problem appeared when we tried to find the export and import amounts, the European Commission provides these features but the crops group initially used, was divided into two parts, the first including cereals and the second seeds, fruits and vegetables. Consequently we had to regroup these two families. At this stage, we had the national production, the exportations and importations of all European members expressed in tonnes. The last variable to measure was the national consumption of crops, but we couldn't find this information in amount, because the majority of the studies measure the share of food products in the budget of inhabitants. Hence, we decided to adapt our research to find the average annual amount of consumed cereals, seeds, vegetables, fruits and transformed products made with the listed raw materials. However, we still couldn't find an accurate figure for all the European countries, so we were forced to estimate this amount at 500Kg per year which is equal to 0,5 tonne. Then, we multiplied this estimated amount with the number of inhabitants in 2018 of each states (PopulationPyramid.net, 2019) to have the national consumption.

Now, we have all the necessary data to measure two rates, they will express in percentage the independence capacity of the countries, 100% being the threshold at which the country is self-sufficient. The first will be the Gross Independence Rate and it will show the country's ability to meet its needs without importations as you can see on the following formula (1):

$$\frac{Production_{crops} - Exportations_{cereals} - Exportations_{other\ crops}}{Consumption_{crops}} \quad (1)$$

However, the analysis of the second rate (2), named Net Independence Rate, will reveal the dependence of importations for some countries, and the producing countries of transformed products using the raw materials of crops farming:

$$\frac{Production_{crops} + Importations_{cereals} + Importations_{other\ crops}}{Consumption_{crops} + Exportations_{cereals} + Exportations_{other\ crops}} \quad (2)$$

The study conducted in the previous part allows us to see that 14 countries are dependent on foreign trade in the crops production industry, while the 13 others have their food sovereignty. However, some comments have to be mention and they will be illustrated by the figure 1 below. We will divide the country into several groups and discuss the results before analysing the next rate.

Four countries are far from their independence, two of them are islands and consequently have a limited amount of lands to create fields, so the result is not surprising for Malta and Cyprus. However, it's unexpected that Belgium and Portugal are in this group, because they are some important members of European Union.

The next group are the country who reach half of their sovereignty, and the group includes Italy, Greece, Slovenia, and Luxembourg. It's interesting to see Luxembourg here considering its size.

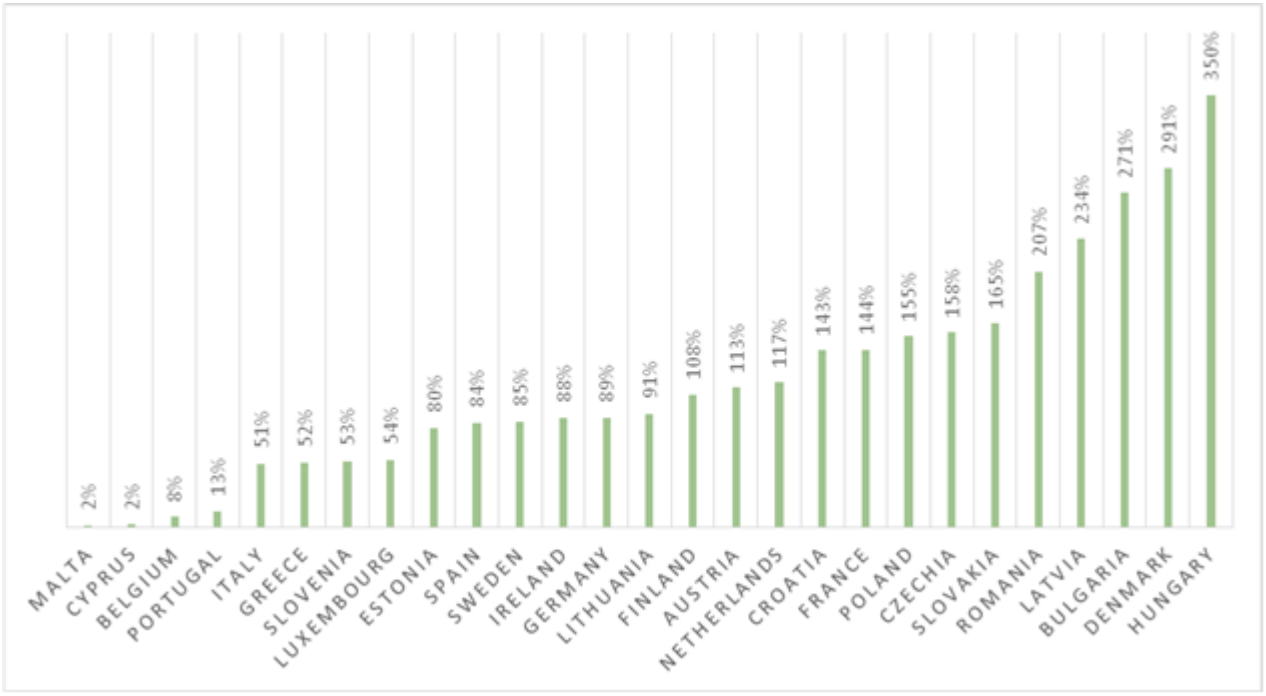


Figure 1 – Bar Chart of Gross Independence Rate of European countries

Thirdly, Estonia, Spain, Sweden, Ireland, Germany, and Lithuania are closed to the self-sufficiency. This group is composed of medium and high-income states. Surprisingly Spain is in this group even if it has a large production capacity.

The independent countries can be divided in two groups, the first one composed of Finland, Austria, Netherlands, Croatia, France, Poland, Czechia and Slovakia. The second, Romania, Latvia, Bulgaria, Denmark and Hungary. These last countries reach at least twice their sovereignty, and most of them are middle-income states.

We will continue our analysis with the Net Independence Rate. Some countries see their rates decreased; it is because their importations are not made for consumption but for transformation of these raw materials to transformed products. Then the transformed products will be sold in the country or traded. On the figure 2 below, 8 countries remain not self-sufficient, unfortunately it shows the main limit of the calculations of the rates because the products analysed are not directly consumed. The consumption has been estimated using the consumption of citizens of transformed products related with cereals and crops. Most of the time the raw materials generated by the farming of crops and cereals are transformed before being traded. Consequently, several countries do not reach independence in our study because they directly import transformed products. These goods are not taken into account in the imports and exports of crops.

Eventually, we will calculate more features to make the analysis of the rates more accurate and more enriching in a subsequent analysis. We will for instance calculate the share of exports in production, the quantity of exports compared to imports, the demographic density, look at the connection of indicators of Agriculture Sustainability and the food independence. Finally, we want to identify the countries of destination or origin of international trade. These will provide us with more knowledge to analyse the agricultural situation of the countries.

At the beginning of this work we wanted to measure the capacity of country to be independent for food production. We faced several problems, so we had to focus on one type of products. In the end, even if the conducted analysis has some imperfections, we could see that half of the European countries depend on foreign trade to satisfy their needs. The literature review revealed that during the humankind history, agriculture and trades were closely connected, the first globalisation was agricultural. Furthermore, we could see a succession of trends in their development and they formed, in the end, a cycle and this has been verified several times throughout the history. We could conclude that we will probably enter in a period of agricultural development in the next years. [3]

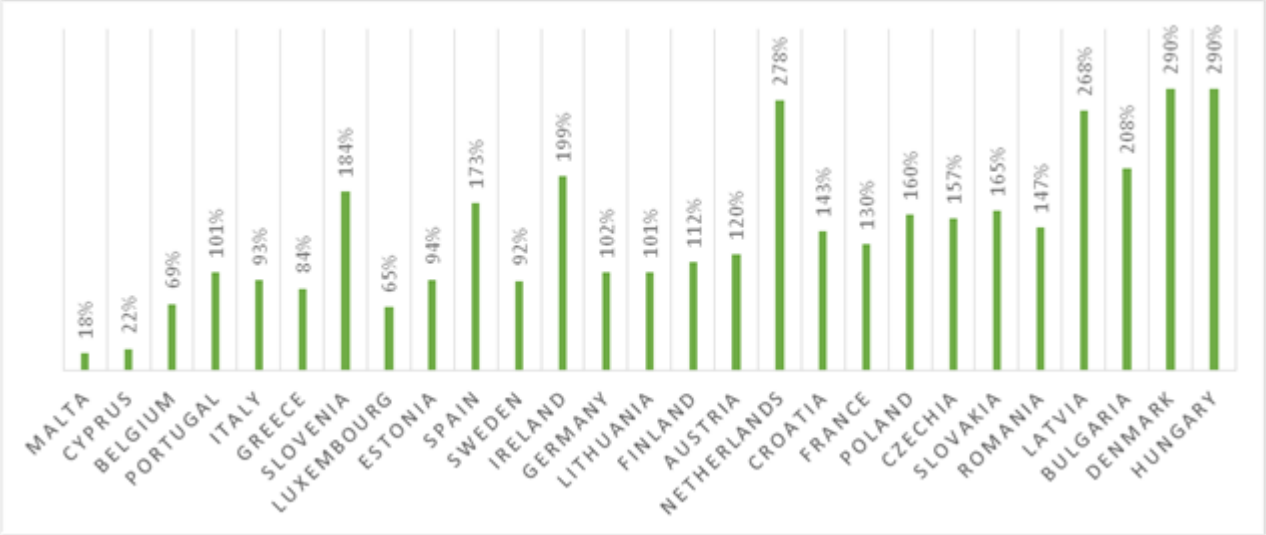


Figure 2 - Bar Chart of Net Independence Rate of European countries

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